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(पहला पुनरीक्षण)

Indian Standard

ELECTRIC TACHOMETER FOR AUTOMOTIVE VEHICLES — SPECIFICATION

(First Revision)

ICS 43.040.10

B U R E A U O F I N D I A N S T A N D A R D S
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December 2013 **Price Group 2**

Automotive Electrical Equipments and Instruments Sectional Committee, TED 11

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Electrical Equipments and Instruments Sectional Committee had been approved by the Transport Engineering Division Council.

This standard was first published in the year 1988. In this revision Shock test, Drop test, Water spray test, Over voltage test, Reverse polarity test, Transient voltage test have been included.

Tachometers on auto vehicles facilitate in guiding the driver to maintain specified engine speed while driving in various gears. It is an essential item for proper maintenance of a vehicle.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

ELECTRIC TACHOMETER FOR AUTOMOTIVE VEHICLES — SPECIFICATION

(First Revision)

1 SCOPE

This standard specifies tests and performance requirements of electric tachometer system with or without hour meter or revolution counters for use on automotive vehicles other than the two and three wheelers.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

IS/ ISO No.	*Title*
2500 (Part 1) : 2000	Sampling inspection procedures: Part 1 Attributes sampling plans indexed by acceptable quality level (AQL) for lot by lot inspection (*third revision*)
9000	Basic environmental testing procedures for electronic and electrical items:
(Part 2/ Sec 3) : 1977	Cold test, Section 3 Cold test for non-heat dissipating items with gradual change of temperature
(Part 3/Sec 3) : 1977	Dry heat test, Section 3 Dry heat test for non-heat dissipating items with gradual change of temperature
(Part 5/Sec 2) : 1981	Damp heat (cyclic) test, Section 2 12 + 12 h cycle
(Part 7/Sec 1) : 2006/IEC 60068-2-27 (1987)	Impact test, Section 1 Shock (test Ea)
(Part 7/Sec 4) : 1979	Impact test, Section 4 Free fall
(Part 8) : 1981	Vibration (sinusoidal) test
(Part 10) : 1979	Mould growth test
(Part 11) : 1983	Salt mist test
(Part 12) : 1981	Dust test
(Part 16) : 1983	Driving rain test
ISO10250 : 1982	Severities for environmental tests for automotive electrical equipment
ISO 7637-2 : 2004	Road vehicles — Electrical disturbances from conduction and coupling — Part 2: Electrical transient conduction along supply lines only
ISO 7637-3 : 1995	Road vehicles — Electrical disturbances by conduction and coupling — Part 3: Vehicle with nominal 12V or 24V supply voltage — Electrical transmission by capacitive and inductive coupling via lines other than supply lines

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Electric Tachometer — A tachometer in which means of detection, transmission and indication are electrical.

3.2 Sensing Unit — A sensing unit supplies signals proportional to the engine speed. There are three types of sensing unit:

a) Magnetic switch or magnetic sensor,
b) Tapping from alternator, and
c) Ignition coil.

3.3 Hourmeter — The hourmeter is a true time indicator of engine run.

3.4 Indicating Unit — The pointer or other means by which the measured engine speed is indicated on the scale.

3.5 Scale — An array of marks together with any associated figures from which the indicated speed (rpm) may be read.

3.6 Scale Mark — One of the marks constituting a scale.

3.7 Scale Length — The distance between the centre of terminal scale marks measured along the scale base.

3.8 Effective Range — That portion of the scale over which the instrument purports to comply with specified limits of accuracy.

3.9 Amplitude — In an oscillatory motion, the departure of the extreme point of the movement of the index from the zero or the rest position.

3.10 Accuracy — The degree of closeness with which the indications of an instrument approach the true values of the quantities measured.

4 CONSTRUCTIONS

4.1 When analog displays are used, the display shall be accomplished by a pointer or other indicator, transversing in a clockwise or left to right direction to indicate increasing revolutions per minute over a suitable scale on the indicating dial.

4.2 Graduation shall be legibility and accuracy of reading.

4.3 The indicating unit case shall be provided with mounting stud with suitable 'U' clamps or similar arrangement.

4.4 The overall dimensions shall be as per the agreement between the purchaser and the supplier.

5 TESTS

5.1 Acceptance Test

The following tests shall constitute acceptance tests:

a) Visual test,
b) Accuracy test,
c) Index stability test,
d) Voltage variation, and
e) Insulation test.

5.1.1 *Visual Test*

When visually examined the instrument shall be free from defects.

5.1.2 *Accuracy Test*

The tachometer indication shall be within ± 2 percent of full scale with nominal voltage. If a calibrator is used it shall supply a signal having the same characteristics as that supplied by the ignition system or an alternator ac taps. The calibration of tachometers shall be made with the instrument in approximately the same angular position that it will have when mounted on the vehicle. Measurements shall be made between 0 to 100 percent of the range to establish the overall accuracy specified in Table 1.

5.1.3 *Index Stability Test*

The tachometer shall be driven by a uniformly steady drive with a signal from an ignition system or from an alternator ac tap. A calibrator also shall be used provided the signals having same characteristics of ignition system or an alternator ac tap. When tested the index of the tachometer shall have a smooth and continuous reading for a gradually increasing and decreasing speed and at any one reading the index oscillation shall be within ± 2 percent of the full scale indicator for any indicated value.

5.1.4 *Voltage Variation Test*

The permissible variation in readings of the instrument due to variation in voltage is given in Table 2.

Table 1 Accuracy of Engine RPM Indication
(*Clause* 5.1.2)

Sl No.	Instrument	Nominal Voltage	RPM Allowable System Variation
(1)	(2)	(3)	(4)
i)	Tachometer	12 /24 V dc for 12 /24 V system	± 2 percent of full scale reading at temperature of 24 ± 3°C
ii)	True hourmeter (hourmeter indication)	do	± 2 percent of elapsed time at temperature of 24 ± 3°C
iii)	Hourmeter proportional to number of revolutions of the engine	do	±2 percent with nominal input rpm required to indicate 1 h and at a temperature of 24 ± 3°C

Table 2 Voltage Variations
(*Clauses* 5.1.4 *and* 5.2.14)

Sl No.	Instrument	Voltage	Variation
(1)	(2)	(3)	(4)
i)	Tachometer	12/24 V dc for 12/24 V system	±3 percent of full scale reading at temperature of 24 ± 3°C
ii)	True hourmeter	For 12 V system 10-16 V dc	±3 percent of elapsed time at temperature of 24 ± 3°C
iii)	Hourmeter proportional to number of revolutions of the engine	For 24 V system 22-32 V dc	±3 percent with nominal input rpm required to indicate 1 h and at a temperature of 24 ± 3°C

5.1.5 *Insulation Resistance Test*

Insulation resistance shall be more than one mega ohm when measured between the gauge terminals and outer case at ambient temperature with a 500 V dc.

5.2 Type Tests

5.2.1 The following shall constitute the type tests:

a) Cold test,
b) Dry heat test,
c) Damp heat (cyclic) test,
d) Dust test,
e) Rapid change of temperature test,
f) Mould growth test,
g) Corrosion resistance test,
h) Contamination test,
j) Vibration test,
k) Shock test,
m) Drop test,
n) Endurance test,
p) Water spray test.
q) Over voltage test,
r) Reverse polarity test,
s) Transient test, and
t) Electromagnetic compatibility test.

5.2.2 For the purpose of type tests, the tachometers shall be classified as group 3 equipment (*see* IS 10250).

5.2.3 *Cold Test*

The tachometer shall comply with **4.4.2** of IS 10250 when tested in accordance with IS 9000 (Part 2/Sec 3). The duration of exposure shall be 2 h at –10°C. After the test, sample shall also satisfy the accuracy test as specified in **5.1.2**.

5.2.4 *Dry Heat Test*

The tachometer shall comply with **4.2.2** of IS 10250 when tested in accordance with IS 9000 (Part 3/Sec 3). The duration of exposure shall be 4 h at 70°C. After the test, sample shall also satisfy the accuracy test as specified in **5.1.2**.

5.2.5 *Damp Heat (Cyclic) Test*

The tachometer when tested in accordance with IS 9000 (Part 5/Sec 2) shall comply with **4.3.2** of IS 10250. The number of cycles shall be 7 and the recovery period shall be 24 h. After the test, sample shall also satisfy the accuracy test as specified in **5.1.2**.

5.2.6 *Dust Test*

The tachometer shall comply with **4.6** of IS 10250 when tested in accordance with IS 9000 (Part 12). The duration of test shall be 5 h. After the test, sample shall also satisfy the accuracy test as specified in **5.1.2**.

5.2.7 *Rapid Change of Temperature Test*

When the tachometer is tested in accordance with **4.5** of IS 10250, it shall comply with the following cyclic conditions:

Cold	–10°C, *Min*
Hot	+70°C, *Max*
Number of cycles	2
Duration	30 min

After the test, sample shall also satisfy the accuracy test as specified in **5.1.2**.

5.2.8 *Mould Growth Test*

The tachometer shall comply with **4.7** of IS 10250 when tested as per IS 9000 (Part 10).

5.2.9 *Corrosion Resistance Test*

The tachometer shall comply with **4.8** of IS 10250 when tested in accordance with IS 9000 (Part 11). The duration of exposure shall be for 50 h consisting of two periods, each period being of 24 h of spraying and 1 h draining. After the test, sample shall also satisfy the accuracy test as specified in **5.1.2**.

5.2.10 *Contamination Test*

The tachometer shall comply with **4.9** of IS 10250 when tested for contamination requirements.

5.2.11 *Vibration Test*

The tachometer shall comply with **6.2** and **6.3** of IS 9000 (Part 8) when tested for vibration requirements. After test, there shall be no visible damage and shall also satisfy the accuracy test as specified in **5.1.2**.

5.2.11.1 *Sensor only (engine mounted)*

The sensor shall be capable of withstanding 6 h of vibration without mechanical or electrical failure, 2 h in each direction along the three mutually perpendicular axis. One of axis is parallel to the input shaft. The vibration test shall be done at intervals of 1 min as indicated below:

Instrument	*Duration*	*Frequency*	*Amplitude*
Tachometer indicating unit	6 h (2 h in each direction along the three mutually perpendicular axis)	10-55-10 Hz	0.75 mm
Sensing unit	6 h (2 h in each direction along the three mutually perpendicular axis)	10-120-10 Hz	0.50 mm

5.2.12 *Shock Test*

The tachometer shall comply with IS 9000 (Part 7/Sec1). After the test, sample shall also satisfy the accuracy test as specified in **5.1.2**.

5.2.13 *Drop Test*

The tachometer shall comply with IS 9000 (Part 7/ Sec 4). The drop height shall be 500 mm. After the test, sample shall also satisfy the accuracy test as specified in **5.1.2**.

5.2.14 *Endurance Test*

The tachometer with the sensing unit shall be capable of functioning satisfactorily within the limits of accuracy specified in Table 2 for a life of 1 500 h at a scale reading of approximately 25 percent to 75 percent of the full scale reading with cycle time of 5 min or at any higher reading mutually agreed between the manufacturer and the purchaser. After the test, sample shall also satisfy the accuracy test as specified in **5.1.2**.

NOTE — Before and after each type test the instrument shall be checked for accuracy test.

5.2.15 *Water Spray Test*

When the tachometer is tested as per IS 9000 (Part 16), exposing only the front parts for 2 h. All the opening shall be suitably sealed except in case of waterproof gauge. After test, there shall be no visible entry of water inside the gauge. After the test, sample shall also satisfy the accuracy test as specified in **5.1.2**.

5.2.16 *Over Voltage Test*

Tachometer shall withstand 1.5 times of the nominal voltage for 1 h (long duration test) and 2 times of nominal voltage for 1 min (long duration test).

5.2.17 *Reverse Polarity Test*

For tachometer of nominal voltage 12 V and 24 V, apply the test voltage of 13 V and 26 V respectively with the reverse electrode for 1 min. After the test, sample shall be examined for the existence of any abnormalities. After the test, sample shall also satisfy the accuracy test as specified in **5.1.2**.

5.2.18 *Transient Voltage Test*

The tachometer shall comply with requirements of ISO 7637-2 and ISO 7637-3.

5.2.19 *Electromagnetic Compatibility Test*

The receiver unit of the gauge shall meet the statutory electromagnetic compatibility requirements, as agreed to between the manufacturer and the user.

6 MARKING

6.1 Unless otherwise specified the each unit shall be marked with the manufacturer's name, serial number, date of manufacture, trade name/brand name, accuracy range (± 2 percent on full scale deflection) printed, preferably on dial.

6.1.1 The casing shall contain indications for electrical connections, circuit diagram and any other marking as agreed to between the suppliers and the purchasers.

6.1.2 For sensing units, the marking shall be as agreed to between the suppliers and the purchasers.

6.2 BIS Certification Marking

The tachometers may also be marked with the Standard Mark.

6.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufactures or producers may be obtained from the Bureau of Indian Standards.

7 PACKING

The units shall be packed as per prevalent trade practice. However, care shall be taken to prevent damages while in transit.

8 SAMPLING

Unless otherwise agreed upon the sampling plan shall be in accordance with IS 2500 (Part 1).

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

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